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(54) Titre : CERTIFICATION ELECTRONIQUE VIRTUELLE PAR METHODE DE TRAITEMENT DE DONNEES SUR UN RESEAU DE COMMUNICATION
(54) Title: ELECTRONIC VIRTUAL CERTIFICATION BY DATA PROCESSING METHOD VIA A COMMUNICATION NETWORK

VIRTUAL PROCESS METHOD FOR PROFESSIONAL CERTIFICATION
UNIVERSAL FORMAT FOR ALL PROFESSIONS UNDER CODE LAW,
REGULATION AND STATE-OF-THE-ART RULES
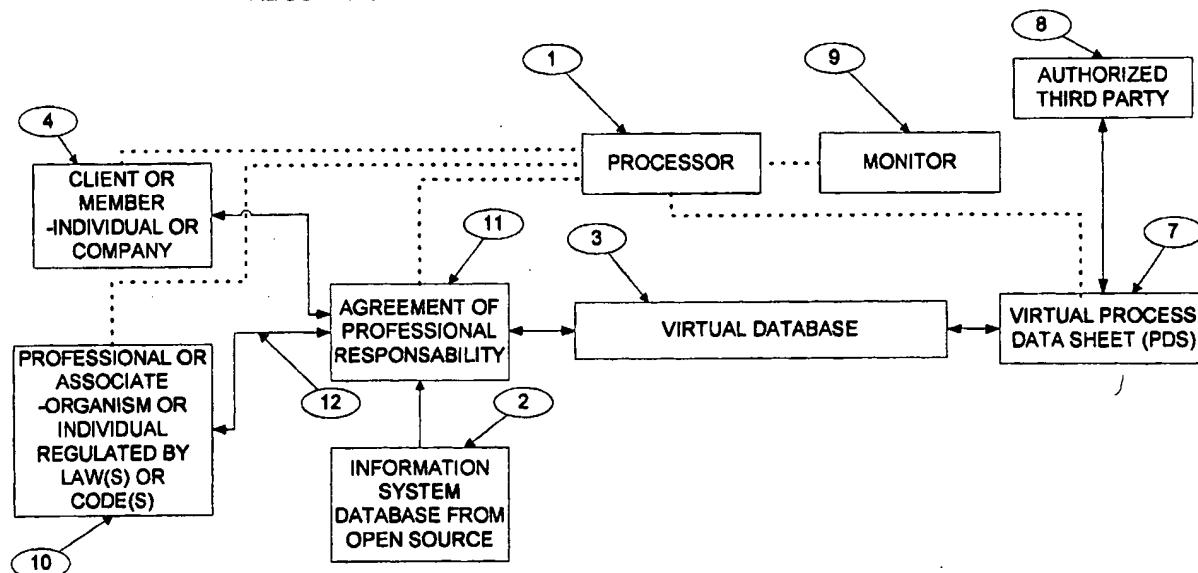
(57) Abrégé/Abstract:
An on-line certification service accessible over a communication network. Data concerning members formed of service entities and individuals are stored in a member database. Certification records associated with the members, based on data representing a standard, are stored in a certification database. A controller connected to the databases and the communication network registers the members, collects certification data, processes audited information from the members and manages the certification records accordingly with respect to the standard, manages access rights to selected elements of the certification records, and reports the selected elements of the certification records to an authorized user.

910   **Abstract**

An on-line certification service accessible over a communication network. Data concerning members formed of service entities and individuals are stored in a member database. Certification records associated with the members, based on data
915   representing a standard, are stored in a certification database. A controller connected to the databases and the communication network registers the members, collects certification data, processes audited information from the members and manages the certification records accordingly with respect to the standard, manages access rights to selected elements of the certification records, and reports the selected elements of the
920   certification records to an authorized user.

Electronic virtual certification by data processing method via a communication network

5   **Field of the invention**

The present invention relates to an on-line service method and apparatus accessible over a communication network, and more particularly to an on-line multifunctionnal virtual certification platform which implements certain predefined certification standards.

10   Such a service is particularly useful for enhancing communication and exchanges between companies seeking third party witnessing services for certification purposes. It also serves to structure steps and processes implemented by companies for quality, cost and delay controls and other purposes. This leads to more efficient dissemination of information about the qualifications and competencies of persons being certified with

15   the present invention. It therefore leads to a wider recognition of companies and other organizations using the invention.

In this patent, the term third party is always used in connection with three party proceedings. The first two parties involved in the three party proceedings are the

20   principles:

-a member of the certification service, using the service for the management of his certification.

-a client or other entity involved in proceedings with this member.

-The term third party refers to an entity, other than the principles, whose

25   function in the proceedings is to vouch that the certification of the member was completed in compliance with the standards associated to the certification.

Background of the invention

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With the increasing popularity of the Internet and the World Wide Web, it has become common to encounter Web sites displaying technical service information. One example of such a Web site is the online virtual certification site of

35 WWW.123CERTIFICATION.COM, the assignee of the present application. This site provides an example of one possible implementation of this invention. The site functions as an on-line certification tool for welding plants and shops. Such companies can access updated information about their certification status and related information about all the steps involved in the certification process. These companies can, at their

40 discretion, disclose some of this information to another party, such as a client of the company, in the course of their technical or business relationship with that party.

One problem commonly encountered by a certification organisation, which is not on-line, resides in an inability to effectively answer requests for information about the status

45 of the technical ability of the companies certified by the organisation. In the increasingly complex welding business, the number of codes and standards is increasing and their size is expanding. A good welding shop can be ignored by a potential client if its certification paper work is not properly filed. On the other hand, in these days of ISO certification, it is possible to demonstrate to a client or inspector convincing paper work

50 without necessarily having the level of competence and excellence that the paper work would suggest. In particular, this is possible in the case of such highly specialized processes such as welding. Because the client or inspector cannot physically inspect welded goods via a Web site, and typically cannot talk to a welding supervisor, it is desirable that a technical Web site, that the welding shop or company makes available,

55 provide access to information that can be relied upon by the client or inspector to make an informed decision before signing a contract. Such information would include specialty welding cards, welding data sheets, and check lists which have been audited by people with the appropriate authority. In many cases, however, the welding plant or shop lacks the resources needed to generate or obtain such information, especially if

60 the plant or shop welds a large and diverse selection of products.

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Summary of the invention

According to the present invention, there is provided an on-line certification apparatus
65 and service accessible over a communication network, comprising:

a member database for storage of data concerning members. Members being
service entities such as companies and individuals associated with these entities such
as employees;

a certification database for storage of certification records associated with the
70 members. These certification records confirm that a member has been certified
according to some predetermined certification process; and

a controller connected to the databases and the communication network, and
performing the following operations:

registering the members into the member database. The member database
75 contains information provided by the members over the communication network
following a member registration process under control of the controller;

collecting certification data about member individuals based on audited
information provided by the members over the communication network following an
auditing process under control of the controller;

80 Checking whether the audited information meets the requirements of the
certification process and conferring certification on the individual if the requirements are
met. Updating the records to reflect the new certification status;

managing access rights to selected elements of the certification records of each
member based on access right information provided by the members over the
85 communication network following an authorization process under control of the
controller; and

reporting the selected elements of the certification records corresponding to the
access rights of a requester. The records are reported over the communication network
following a report process under control of the controller in response to an information
90 request received from the requester over the communication network.

According to the present invention, there is also provided a method for on-line
certification of members of a service over a communication network, comprising the
steps of:

95   registering the members based on information provided by the members over the
communication network following a member registration process under control of the
service;

collecting certification data pertaining to individuals associated to service entities
having registered as members of the certification service, based on audited information
100   provided by the members over the communication network following an auditing
process under control of the service;

processing the audited information with respect to certification process
specification data; managing certification records associated with the members as a
function of the audited information processed by the service;

105   managing access rights to selected elements of the certification records based
on access right information provided by the members over the communication network
following an authorization process under the control of the service; and

reporting the selected elements of the certification records corresponding to the
access rights of a requester over the communication network. This will involve a report
110   process under control of the service in response to an information request received from
the requester over the communication network.

According to the present invention, there is also provided a member site connectable to
an on-line certification site over a communication network, comprising:

115   a user interface for interaction with a user;

a port for communication with the on-line certification site through the
communication network;

a data storage for storing the data entered by the user and data received from
the on-line certification site; and

120   a processor connected to the user interface, the data storage and the port, the
processor comprising:

a means for establishing communication with the certification site upon user
request;

a means for transmitting user identification data to the certification site;

125   a means for receiving data from the certification site depending on access rights
granted to the user based on the user identification data;

a means for displaying operations selectable by the user on the user interface
depending on the information data received from the certification site, the operations

comprising requesting a certification and updating a certification record associated with .

130   the user;

a means for displaying certification information on the user interface depending on the information data received from the certification site; and

a means for transmitting requests for the execution of the operations selected by the user through the user interface and data related to the operations to the on-line

135   certification site.

The term, processor, refers to a device, a person or a combination of the two with the task of preparing, treating, storing, updating, transferring, reporting, simulating or calculating given data within the network.

140

According to the present invention, there is also provided a system for on-line certification of members over a communication network, comprising:

a data storage;

a controller connected to the data storage; and

145   instructions stored in the data storage for controlling the controller,

the controller being operative with the instructions to:

register the members by storing data concerning the members into the data storage based on information provided by the members over the communication network following a member registration process under control of the controller;

150   collecting certification data   pertaining to member individuals based on audited information provided by the members over the communication network following an auditing process under control of the controller;   .

processing the audited information with respect to the process specification data;

managing certification records as a function of the audited information processed

155   by the controller;

storing the certification records in the data storage;

managing access rights to selected elements of the certification records based on access right information provided by the members over the communication network following an authorization process under control of the controller; and

160   reporting the selected elements of the certification records corresponding to the access rights of a requester over the communication network following a report process under control of the controller in response to an information request received from the requester over the communication network.

165   According to the present invention, there is also provided a data processing system for
       determining conformity of member-submitted business process steps to process
       specification data required to obtain certification and for reporting certification status of
       the business process steps, comprising a controller and a data storage operatively
       connected to the controller, the process specification data being stored in the data
170   storage, the controller being configured to:
              receive process data defining the business process steps subjected to the
       certification;
              determine the conformity of the business process steps based on whether
       variables defined in the process data fall in acceptable ranges defined in the process
175   specification data;
              establish the certification of the business process steps depending on the
       conformity determined;
                     store certification data indicative of the certification in the data storage; and
                     produce and transmit a certification status report, using the certification data
180   stored in the data storage, in response to a report request validated by the controller.

       The word, determining, refers to the task of definitely ascertaining the compliance of
       given data to predetermined criteria. This task may involve, but is not limited to,
       considering, analyzing, interpreting, simulating and calculating data within the network.
185   The task may be completed by a device, a person or a combination of the two.

       According to the present invention, there is also provided a method for determining
       conformity of member-submitted business process steps to process specification data
       required to obtain certification and for reporting certification status of the business
190   process steps, comprising steps of:
              receiving process data defining the business process steps subjected to the
       certification;
              determining the conformity of the business process steps based on whether
       variables defined in the process data fall in acceptable ranges defined in the process
195   specification data;
              establishing the certification of the business process steps depending on the
       conformity determined; and

producing and transmitting a certification status report using the certification data in response to a valid report request.

200

According to the present invention, there is also provided computer executable process steps, operative to control a computer, stored on a computer readable medium. These determine conformity of member-submitted business process steps to process specification data required to obtain certification and report the certification status of the

205   business process steps, comprising:

a step to receive process data defining the business process steps subjected to the certification;

a step to determine the conformity of the business process steps based on whether variables defined in the process data fall in acceptable ranges defined in the

210   process specification data;

a step to establish the certification of the business process steps depending on the conformity determined; and

a step to produce and transmit a certification status report using the certification data in response to a valid report request.

215

According to the present invention, there is also provided, in a communication network system with remote sites and a centre, a method for determining conformity of member-submitted business process steps to process specification data required to obtain certification. There is also provided a method for reporting certification status of the

220   business process steps, comprising steps of:

transmitting process data defining the business process steps subjected to the certification from one of the remote sites to the centre;

determining the conformity of the business process steps based on whether variables defined in the process data fall in acceptable ranges defined in the process

225   specification data;

establishing the certification of the business process steps depending on the conformity determined; and

producing and transmitting a certification status report using the certification data from the centre to an authorized one of the remote sites having requested the

230   certification status report.

The following provides a non-restrictive summary of certain features of the invention which are more fully described herein in relation with preferred embodiments thereof.

235   The present invention provides a system and a method for enabling an Internet certification entity, referred to herein as the "online certification site" to efficiently certify working processes and workers or professionnals. This application is referring to the welding process but is not limited to this example.

240   To ensure that professionnal activities are monitored for code, standards or law requirements, a monitoring process is engaged in by the controller under an agreement of professional responsibility. This virtual process method of professional certification has a universal format for all professions under code, law regulations or state-of-the-art rules with the help of hyperlinked products in cooperation with Web sites or other

245   network sites of respective business partners, referred to herein as "associates." The system and method are implemented, in part, by software that runs on the "online certification" Web site. Through this site, an entity can enroll (via an automated registration process) as an associate, and can then disseminate list of certified companies (Web documents, PUSH documents, e-mail newsletters, etc.) that include

250   the associate's reviews and/or recommendations on certification. In accordance with one aspect of the invention, the associate catalogue documents include product-specific hyperlinks, referred to herein as "referral links," that allow potential "on-line certified companies" to link to the "online certification" Web site to initiate certification of professionals and/or process.

255

A data notarization method is provided for monitoring and recording the information flow and data, and making all calculations, necessary for maintaining a virtual certification service for professional activities regulated by law, code or state-of-the-art rules. In particular, the data processing method makes a continuous allocation of Process Data

260   Sheets (PDS) that are stored in a Process Data Management System (PDMS). In this present invention, the expression PDMS refers, without limitations to a variety of essential variables data acquisition apparatus consisting of, but not limited to the following; process data trade indexer, main process database, virtual processor for professional certification, tracked certification-list, centre and notarization database,

265   database of essential variables. To ensure a comprehensive reading, only one professionnal activity will be described. However all professionnal and industrial

activities regulated by law or code or state-of-the-art rule could be monitored with the present invention. For a better illustration, the invention will be described only in conjunction with the process of welding. This is an industrial/ engineering process that
270 refers to law, code and state-of-the-art rules.

For the case of welding, the PDMS has stored Process Data sheets named Welding Data Sheets (WDS) with the welding parameters for the appropriate material, welding position, metal deposition method, gas protection etc. All these data could be stored
275 and retrieved with multimedia technology.

A Welder certification checklist will then be used to show a potential client or inspector that a welder is appropriate to do a job. As mentioned before this tracked checklist shows the steps of the certification to any party that the member deems necessary to
280 obtain a job. When the checklist is completed, a welder competency card can be issued to the person who completed this checklist. This checklist will be the traceable proof of his completion of the certification process.

The online system will then have the ability to show the status of qualification of the
285 welder and/or the status of the welding procedure approval to any of the member's customers or a third party. An online status report of the progress achieved in the certification process will also be available. This status report will be available in the form of a checklist. The data in this status report is encrypted to ensure confidentiality; only registered users with the appropriate access rights will be allowed to edit the data in the
290 online status report.

The fact that the system is on-line, combined with the use of a check list and all the functions related thereto, with update and approval procedures, allows outstanding control of the process steps and working variables subjected to certification which,
295 because of their retraceable character, provide evidence of the authenticity of the certification.

Brief description of the drawings

300   The objects and features of the present invention will become more apparent
in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic diagram illustrating an on-line virtual certification service
according to the present invention, in one of its simplest forms.

305

FIG. 2 is a schematic diagram similar to the diagram of figure 1, illustrating relationships
to the other figures.

FIG. 3 is a diagram showing the physical configuration of a preferred embodiment of a
310   hub and spoke for an electronic virtual certification by a data processing method via a
communication network, according to the present invention.

Fig. 4 is a flowchart showing an operation flow of the data trade indexer for a
certification according to the present invention, this method being applied to a welding
315   certification scenario.

Fig. 5 is a flowchart showing an operation flow of the main process database with the
notarization database applied to a welding certification scenario, according to the
present invention.

320

Fig. 6 is a flowchart showing an operation flow of the certification method for a welding
scenario, an operation flow of accepting or registering a new member site and a layout
example of the authentication database, according to the present invention.

325   Fig. 7 is a flowchart showing an operation flow of certification steps & interface display
for the welding scenario, according to the present invention.

Fig. 8 is a diagram showing an example of a welding card holder according to the
present invention.

330

Fig. 9 is a diagram showing an example of an on-line welding certification checklist,
according to the present invention.

Fig. 10 is a diagram showing an example of a list of essential variables for welding
335 certification, according to the present invention.

Description of the preferred embodiments

A description will now be given, in detail, of an embodiment in accordance with the
340 present invention. The present invention is not restricted by this embodiment.
A data notarization method is provided for monitoring and recording the information flow
and data, and making all calculations, necessary for maintaining a virtual certification
service configuration according to a tracked certification described below.

345 Referring to Figures 1 and 3, a centre, called the processor 1, intervenes in a process
and the user certification method achieved through a network. For a better
understanding of this method, the logical structure of the configuration is shown in figure
1 and the physical structure of the configuration is described in figure 3. The centre
includes all information received from member sites 4 connected to the network which
350 will be used as open audited information. All sorts of information from the open source 2
may also be used to improve the content of the virtual database. A notarization
database 3 keeps therein the contents of audited steps of the certification between the
centre and members 4. The centre receives a request from a member site to certify a
member and forwards the request to an information supply site associated therewith
355 (included in the virtual database 3). The processor 1 intervenes in a certification
procedure carried out between the information supply site and the member site and
conducts a notarization process for the step of the certification in question. This step is
recorded in a notarization database 3. Through processor 1, a professional or
associate 9 is updating the monitor 9 to the required standard accordingly.

360
To ensure a safe storage and to protect the validity of the tracked, audited certification
data, all information coming from members 4 or from 10 into step 11 will be digitally
encrypted and their source will be recorded for essential steps of approval. This
encryption may be achieved using a conventional method involving for example private
365 or public keys, whichever is available in the network, through an authentication
database. A transparent checklist shows the process of certification to any party that
the member deems necessary. An output could be, for example, a competency card or

any technical output such as a certified drawing, certified calculation or a certified diploma which refers to this checklist 7.

370

The input could be any essential variables that have to be kept in a tracked certification checklist for future reference. This checklist will be protected to ensure safety and privacy.

375   Fig. 2 shows the logical structure of an embodiment of an electronic virtual certification service via a communication network according to the present example of the invention. The algorithm elements are shown in figure 1. The purpose of figure 2 is to properly connect all figures, 3 to 10, to this invention. There are four detailed notes showing how the upcoming figures are all linked together.

380

Link 6 and link 12 show bi-directional flow between algorithm elements. These links could use encrypted technology.

Fig. 3 shows the physical structure of an embodiment of an electronic virtual certification
385   service via a communication network 32 according to the present invention. The system includes member sites 4 which participate as members of the embodiment of the transaction system in the electronic virtual certification process and an open certification database centre 3 provides services to the members 4. The centre 3 is mutually connected via a network 32 to the member sites. Moreover, the open certification
390   database centre 3 is coupled with an external network 32 with an administrator/ controller 33. The term "external network" represents a network other than the constituent elements of the electronic virtual certification system, i.e., a network such as the Internet constituting another electronic system. Each member site 4 can be connected via the centre to the external network. For safety and security, the
395   network is desirably a closed network using a leased line; however, it is possible to use a public telephone line or the Internet. Each of the centre and member sites 4 includes an information processing apparatus such as a personal computer, a workstation, a mainframe computer, a hand-held computer device, or an administrator/ controller 33. Each information processing apparatus includes a communication line interface with a
400   network card or an equivalent.

The centre 3 includes a member information database 39 to control information related to the respective member sites of the transaction system, an authentication database 35

to verify each member site, a notarization database 38 to notarize transaction data in
405   the business transaction carried out between member sites, a monitoring database 31,
a contract amount main process database 37, to manage information about the contract
amount involved in the business transaction between member sites, and a process
report database 34 to supply various reports and information to the respective
members.

410

These databases are preferably stored in a storage external to the information
processing apparatus. The centre includes an administrator 33, which supervises
programs included therein to control and monitor the databases, so as to
implement various functions provided by the centre. The administrator includes a
415   controller or processor 1 and the memory device of the information processing
apparatus. It executes various software programs through the processor to achieve
functions such as the relationships between items 4,10,11, 7 and 9.

Any number of member sites 4 can be connected to the centre 3. In the illustrated case,
420   the five member sites 4 mutually carry out process reports and are operated by a
manufacturer, a third party, a regulation agency and the like. One of the member sites,
for example, member site 5 could include a settling function to settle business
transactions accomplished by the other member sites 1 to 4. The site 5 could
be operated, for example, by a regulation agency. Although five member sites are
425   shown in the diagram for convenience of explanation in this embodiment, there may be
more member sites connected to the system.

Communication of requests, and acceptance of requests from the administrator that is
monitoring the database of acceptance criteria and associated data items between the
430   centre and the member sites 1 to 5 are carried out in conformity with a protocol used by
the network. The centre and member sites have a password procedure to ensure the
security of the confidential information involved in producing a data record. This
procedure is applied also to requests for or reception of data in accordance with a
specified protocol and also to the sending of data to the network. These sites further
435   include a function for receiving data records via the network and extracting the
necessary information, such as the information shown in fig. 8, 9 and 10.

-14-

Fig. 4 is a flowchart showing an operation flow of the data trade indexer for a
certification. This method is applied to a welding certification scenario. A member site
440 (as shown in Figure 3) can access a web site display by typing in a username and
password (item 41) to access confidential information. A menu (item 43) will then
display the possibilities of submitting a customer welding request or of update data from
existing status documents. If there is an interest in a document, the member site can
access the displayed information.

445

If the member site is interested in updating the welder status, he can update the online
certification checklist by editing the audited step he performed. (item 42) This review
(item 45) is made secure by the use of encrypted digital fingerprints. Examples of
available reports (item 44) are shown in fig. 8, 9 and 10. These are preferred
450 embodiments but the present invention is not limited to these examples.
In figure 8, the welder's name 81 that is authenticated in the database, the issue date
and expiration date 82, a list of essential variables 83, the name of a person responsible
for test certification 84 and a name and signature of a site member 85 are examples of
the minimal requirements for a welder competency card holder.
455 In figure 9, there is shown an innovative checklist 91, which is used in conjunction with
this virtual certification invention. This checklist 91 will be the traceable reference of all
the steps that could be required by a potential client, inspector or third party to ensure
himself that the welder test was done according to the code requirements. In this
diagram, item 92 shows a "responsible reference" designation, which a person will refer
460 to for the encryption of his own digital print or electronic seal 93. The method of adding
a digital print to a process step is shown in figure 4. The combination of this digital print
process with the virtual certification with the centre 3 and the security password 41 of
the communication network will permit the updating of the main process database 37
with the sequence shown in figure 4 and the updating of the main process database 42
465 when required until all the steps of the check list 91 are completed. In the last decision
box of figure 4, part 2, the client or member-individual or company is notified for updated
welding informations, from his member site 4, the potential client or inspector 63 can
have his own access to the information shown in figures 8,9 or 10 and will be able to
determine, even from a remote location, whether the company has the minimum
470 workmanship and expertise required to fulfill a contract according to a set of code
requirements. The potential client or inspector will also be able to determine whether the
digital print is one of the four following levels of

competency; welder (W) item 94, authorized worker (AW) item 96, welding Engineer (WE) item 95 or a Laboratory (LABO) item 97. In this way, the potential client or
475 inspector will be able to decide whether the checklist was completed in a fashion deserving a high or a low level of confidence in the integrity of the information he received. Note that this check list is an example only, and the minimal level of confidence for every third-party can vary based on item 94 on the check list or at the opposite a higher number of 95 and 97 when the third-party requires a higher level of
480 confidence depending on the difficulty of the welder test. In this checklist example, there are 22 items, which are listed according to a chronological sequence that permits a potential client, inspector or third party to verify the status of the welder certification. In particular, items 1 to 8 refer to pre-welding steps. Item 9 refers to the welding step itself. Items 10 to 22 refer to post-welding steps that are the back-up information for the virtual
485 certification.

Figure 10 is an output consisting of essential variables and consisting of reference information that is meant to be used by a welder for his work assignment and for his certification. The essential variables are a drawing cutaway of the part to be assembled
490 101, a cutaway drawing of the weld assembly 102, a list of welding code references 103, a list of essential welding variables 104. This output is produced using information from the certification database centre 3 and is viewable from a member site 4 with the figure 5 or 6 diagrams.

495 Fig. 5 shows a flowchart illustrating an operation flow involving the use of the information stored (item 51) in the main process database (item 53) and the notarization database applied to a welding certification scenario. A welding document can be produced either by a member site or by a regulation agency. This document has to be monitored by code regulations and will be revised until the code check is
500 completed (item 54) while referring to the notarization database (item 38). The code could be either an internal technical code or a regulatory agency code such as American Welding Society (AWS), American Society of Mechanical Engineer (ASME), American Bureau of Shipping (ABS), Association of American Railroads (AAR), American Petroleum Institute (API), Canadian Standard Association (CSA)
505 Code or any other international regulatory agency code.

This loop will then be performed until approval by an engineer or any certified welding inspector (item 52) is obtained. If a third party approval (AISC, AWS or CSA) is required (item 55), another loop of approval can be performed until code approval.

510

As illustrated in Fig. 6, a client/member can consult a paid document as depicted by box 61, by entering a password which can be provided either on a daily basis or on a permanent basis, as depicted by 6 2. In the event that the password is invalid, a message is displayed which will explain the reason for not entering the web site and will

515   access information about how to enroll, if it is a case of a new member site. When the password is valid, the member site will have access to all his certification information as shown in the layout example of the authentication database. This method will also allow a potential client or inspector (item 63), designated by the member site, to have access to some information that the member site will consider to have some interest to the

520   potential client or inspector. The advantage of an online certification method is to show a potential client or inspector the level of technology available in the company without having to perform a demonstration to the potential client or inspector. This figure shows how a third party can access and assess the information he has available in the member site.

525

Fig. 7 shows a flowchart illustrating an operation flow of certification steps & interface display for the welding scenario. This figure describes an existing web site with web pages of existing documents. Four displays of documents are shown in this invention as preferred embodiments (Item 71). Note that there could be other related documents that

530   could be requested by member site or by a potential client, inspector or third party request. A report (item 72) can be produced periodically to ensure that certification is in progress or to ensure that certification is maintained according to monitored data that are required by a monitoring process shown previously. If a hard copy of welder's comptency card (item 73) or engineer report (item 74) is required, one can be printed

535   and sent to the person, company or regulatory agency that requires such information.

Claims

1. An on-line certification service apparatus accessible over a communication
540   network, comprising:

A member database for storage of data concerning members comprising service
entities and individuals associated with the entities;

a certification database for storage of certification records associated with the
members based on predetermined process specification data; and

545   a controller connected to the databases and the communication network, and
performing operations comprising:

registering the members into the member database based on information
provided by the members over the communication network following a member
registration process under control of the controller;

550   collecting certification data for the individuals based on audited information
provided by the members over the communication network following an auditing
process under control of the controller;

processing the audited information with respect to the process specification data
and managing the certification records as a function of the audited information

555   processed by the controller;

managing access rights to selected elements of the certification records based
on access right information provided by the members over the communication network
following an authorization process under control of the controller; and

reporting the selected elements of the certification records corresponding to the

560   access rights of a requester over the communication network following a report process
under control of the controller in response to an information request received from the
requester over the communication network.

2. The on-line certification service apparatus according to claim 1, wherein the

565   operations performed by the controller further comprise:

collecting certification search data provided by a requester over the
communication network following a search process under control of the controller; and

reporting information retrieved from the certification records authorized by the
members and matching the certification search data to the requester over the

570   communication network.

3. The on-line certification service apparatus according to claim 1, wherein the process specification data comprise working procedures and parameters associated with the working procedures required for certification, and the operations performed by 575 the controller further comprise determining whether the parameters comply with the process specification data.

4. The on-line certification service apparatus according to claim 3, wherein the operations performed by the controller further comprise generating a check list in 580 response to a check list request received over the communication network for a selected one of the individuals, the check list indicating a series of working procedures established for obtaining a predetermined certification for the selected one of the individuals, and data reporting completion states of the working procedures as a function of the audited information provided by the members in respect with the selected 585 one of the individuals.

5. The on-line certification service apparatus according to claim 4, wherein the operations performed by the controller further comprise:

receiving data representing the working procedures from one of the members to 590 which the selected one of the individuals is associated to, in response to a check list edit request received from said one of the members over the communication network.

6. The on-line certification service apparatus according to claim 4, wherein the operations performed by the controller further comprise:

595 submitting the check list to one of the members having authority to approve the working procedures; and

affixing a seal to selected ones of the working procedures in response to approval from said one of the members having authority in respect with the selected ones of the working procedures.

600

7. The on-line certification service apparatus according to claim 6, wherein said one of the members having authority comprises a superior of the selected one of the individuals, and the approval is provided over the communication network.

605 8. The on-line certification service apparatus according to claim 6, wherein the operations performed by the controller further comprise:

submitting the check list to a certification authority before certifying the selected one of the individuals; and

affixing a seal to the check list in response to approval from the certification
610   authority.

9. The on-line certification service apparatus according to claim 8, wherein the operations performed by the controller further comprise:

generating a virtual certification card to the selected one of the individuals once
615   the check list has the seal from the certification authority, and

storing the virtual certification card in the certification database.

10. The on-line certification service apparatus according to claim 9, wherein the virtual certification card has an expiration date and certification information.

620

11. The on-line certification service apparatus according to claim 4, wherein the working procedures indicated in the check list comprises hyperlinks to informative data stored in the certification database.

625   12. The on-line certification service apparatus according to claim 1, wherein the operations performed by the controller further comprise:

executing a security control process before granting access to the data and the certification records to a requester over the communication network.

630   13. The on-line certification service according to claim 12, wherein the security control process comprises:

verifying the access rights depending on the access right information provided by the requester in response to a control request generated by the controller and submitted to the requester; and
635   granting selective access to the data and the certification records based on the access rights.

14. The on-line certification service apparatus according to claim 13, wherein the access right information provided by the members comprises at least one of a password
640   and a digital fingerprint.

15. The on-line certification service apparatus according to claim 13, wherein the operations performed by the controller further comprises selectively enabling editing of the data and the certification records depending on the access rights granted to the

645 requester.

16. The on-line certification service apparatus according to claim 15, wherein the operations performed by the controller further comprises recording identity and authority of the requester and edition date in association with every editing of the data and the

650 certification records.

17. The on-line certification service apparatus according to claim 1, further comprising:

a process report database connected to the controller, for storage of information

655 directly entered by the members and information derived from the audited information provided by the members;

and wherein the operations performed by the controller further comprise reporting the information stored in the process report database to a requester over the communication network depending on and in response to an information request

660 received from the requester over the communication network.

18. The on-line certification service apparatus according to claim 1, further comprising:

an authentication database connected to the controller, for storage of

665 authentication information associated to the members;

and wherein the operations performed by the controller further comprise verifying authentication of the members based on the authentication information stored in the authentication database during interactions with the members.

670 19. The on-line certification service apparatus according to claim 1, further comprising:

a notarization database connected to the controller, for storage of business transaction data;

and wherein the operations performed by the controller further comprise

675 recording the business transaction data in the notarization database during business transactions between the members.

20. The on-line certification service apparatus according to claim 19, further comprising:

680   a main process database connected to the controller, for storage of contract amounts involved in the business transactions between the members;

and wherein the operations performed by the controller further comprise recording the contract amounts in the main process database based on information provided by the members involved in the business transactions over the communication

685   network.

21. The on-line certification service apparatus according to claim 1, further comprising:

a process report database for storage of reports and information addressed to

690   respective ones of the members;

and wherein the operations performed by the controller further comprise providing the reports and information to the respective ones of the members in response to report requests received from the members over the communication network.

695

22. The on-line certification service apparatus according to claim 1, wherein the operations performed by the controller comprise allocating process data sheets in which the audited information provided by the members is entered.

700   23. A method for on-line certification of members of a service over a communication network, comprising steps of:

registering the members based on information provided by the members over the communication network following a member registration process under control of the service;

705   collecting certification data for individuals associated to service entities having registered as members of the service, based on audited information provided by the members over the communication network following an auditing process under control of the service;

processing the audited information with respect to process specification data for

710   certification;

managing certification records associated with the members as a function of the audited information processed by the service;

managing access rights to selected elements of the certification records based on access right information provided by the members over the communication network
715 following an authorization process under control of the service; and

reporting the selected elements of the certification records corresponding to the access rights of a requester over the communication network following a report process under control of the service in response to an information request received from the requester over the communication network.
720

24. A member site connectable to an on-line certification site over a communication network, comprising:

a user interface for interaction with a user;

a port for communication with the on-line certification site through the
725 communication network;

a data storage for storing the data entered by the user and data received from the on-line certification site; and

a processor connected to the user interface, the data storage and the port, the processor comprising means for :
730 establishing a communication with the certification site upon user request;

transmitting user identification data to the certification site;

receiving information data from the certification site depending on access rights granted to the user based on the user identification data;

displaying operations selectable by the user on the user interface depending on
735 the information data, the operations comprising requesting a certification and updating a certification record associated with the user;

displaying certification information on the user interface depending on the information data;

transmitting requests for execution of the operations selected by the user through
740 the user interface and data related to the operations to the on-line certification site.

25. The member site according to claim 24, wherein the certification information displayed on the user interface comprises a certification check list of audited process steps performed by an individual associated with the user.
745

26. The member site according to claim 25, wherein the updating comprises editing the audited process steps.

27. The member site according to claim 25, wherein the processor comprising

750 means of

processing the audited process steps entered by the user through the user interface;

storing the audited process steps in the data storage; and

transmitting the audited process steps stored in the data storage to the

755 certification site upon user request.

28. The member site according to claim 25, wherein the operations comprise registering the user as a member, the processor then transmitting user information entered by the user through the user interface to the certification site, receiving member

760 identification data returned by the certification site, and storing the member identification data in the data storage, the member identification data forming the user identification data.

29. A system for on-line certification of members over a communication network,

765 comprising:

a data storage;

a controller connected to the data storage; and

instructions stored in the data storage for controlling the controller,

the controller comprising means for :

770 registering the members by storing data concerning the members into the data storage based on information provided by the members over the communication network following a member registration process under control of the controller;

collecting certification data for the individuals based on audited information provided by the members over the communication network following an auditing

775 process under control of the controller;

processing the audited information with respect to the process specification data;

managing certification records as a function of the audited information processed by the controller;

storing the certification records into the data storage;

780   managing access rights to selected elements of the certification records based

on access right information provided by the members over the communication network

following an authorization process under control of the controller; and

        reporting the selected elements of the certification records corresponding to the

access rights of a requester over the communication network following a report process

785   under control of the controller in response to an information request received from the

requester over the communication network.

        30. The system according to claim 29, wherein the data storage comprises:

        a member database for storage of the data concerning the members, the

790   members comprising service entities and individuals associated with the entities; and

        a certification database for storage of the certification records.

        31. The system according to claim 30, wherein the data storage further

comprises:

795   a process report database for storage of information directly entered by the

members under control of the controller and information derived from the audited

information provided by the members, the information in the process report database

being available to a requester over the communication network depending on and in

response to an information request received by the controller over the communication

800   network;

        an authentication database for storage of authentication information associated

to the members, the authentication information being used by the controller for verifying

authentication of the members during interactions with the members;

        a notarization database for storage of business transaction data recorded by the

805   controller during business transactions between the members; .

        a main process database for storage of contract amounts involved in the

business transactions between the members, recorded by the controller; and

        a process report database for storage of reports and information addressed to

respective ones of the members, the reports and information in the process report

810   database being provided to the respective ones of the members in response to report

requests received by the controller over the communication network.

        32. A data processing system for determining conformity of member-submitted

business process steps to process specification data required to obtain certification and

815   for reporting certification status of the business process steps, comprising a controller and a data storage operatively connected to the controller, the process specification data being stored in the data storage, the controller comprising means for:

    receiving process data defining the business process steps subjected to the certification;

820   determining the conformity of the business process steps based on whether variables defined in the process data fall in acceptable ranges defined in the process specification data;

    establishing the certification of the business process steps depending on the conformity determined;

825   storing certification data indicative of the certification in the data storage; and

    producing and transmit a certification status report using the certification data stored in the data storage in response to a report request validated by the controller.

33. A method for determining conformity of member-submitted business process

830   steps to process specification data required to obtain certification and for reporting certification status of the business process steps, comprising steps of:

    receiving process data defining the business process steps subjected to the certification;

    determining the conformity of the business process steps based on whether

835   variables defined in the process data fall in acceptable ranges defined in the process specification data;

    establishing the certification of the business process steps depending on the conformity determined; and

    producing and transmitting a certification status report using the certification data

840   in response to a valid report request.

34. Computer executable process steps operative to control a computer, stored on a computer readable medium, for determining conformity of member-submitted business process steps to process specification data required to obtain certification and

845   for reporting certification status of the business process steps, comprising means for:

    receiving process data defining the business process steps subjected to the certification;

determining the conformity of the business process steps based on whether variables defined in the process data fall in acceptable ranges defined in the process

850 specification data;

establishing the certification of the business process steps depending on the conformity determined; and

producing and transmitting a certification status report using the certification data in response to a valid report request.

855

35. In a communication network system with remote sites and a centre, a method for determining conformity of member-submitted business process steps to process specification data required to obtain certification and for reporting certification status of the business process steps, comprising steps of:

860 transmitting process data defining the business process steps subjected to the certification from one of the remote sites to the centre;

determining the conformity of the business process steps based on whether variables defined in the process data fall in acceptable ranges defined in the process specification data;

865 establishing the certification of the business process steps depending on the conformity determined; and

producing and transmitting a certification status report using the certification data from the centre to an authorized one of the remote sites having requested the certification status report.

870

36. The on-line certification service apparatus according to claim 1, wherein:

the individuals comprise welders and persons working in the welding industry sector;

the service entities comprise companies offering services in the welding industry

875 sector; and

the process specification data comprise welding standards.

37. The on-line certification service apparatus according to claim 36, wherein the operations performed by the controller further comprise generating a check list

880 indicating an updatable series of working procedures established for obtaining a predetermined certification for a selected one of the welders, and data reporting

completion states of the working procedures as a function of the audited information in respect with the selected one of the welders.

885   38. The on-line certification service apparatus according to claim 37, wherein the series has a chronological order and comprises pre-welding, welding and post-welding procedures.

          39. The on-line certification service apparatus according to claim 38, wherein the
890   welding procedures comprise a list of essential variables for welding certification which provide reference information used by the selected one of the welders in a work assignation.

          40. The on-line certification service apparatus according to claim 39, wherein the
895   essential variables comprise a drawing cut of a part to be assembled, a drawing cutaway of a weld assembly, a list of welding code references, and a list of welding parameters.

          41. The on-line certification service apparatus according to claim 37, wherein the
900   check list comprises responsible identification and digital fingerprint fields associated with the working procedures, the responsible identification fields identifying the individuals editing data in relation with the working procedures respectively, and the digital fingerprint fields showing digital fingerprints of the individuals editing the data respectively.

905

          42. The on-line certification service apparatus according to claim 41, wherein the digital fingerprints comprise information based on identifications of the individuals and security information entered by the individuals.

FIG.-1 VIRTUAL PROCESS METHOD FOR PROFESSIONAL CERTIFICATION UNIVERSAL FORMAT FOR ALL PROFESSIONS UNDER CODE LAW, REGULATION AND STATE-OF-THE-ART RULES

1/10
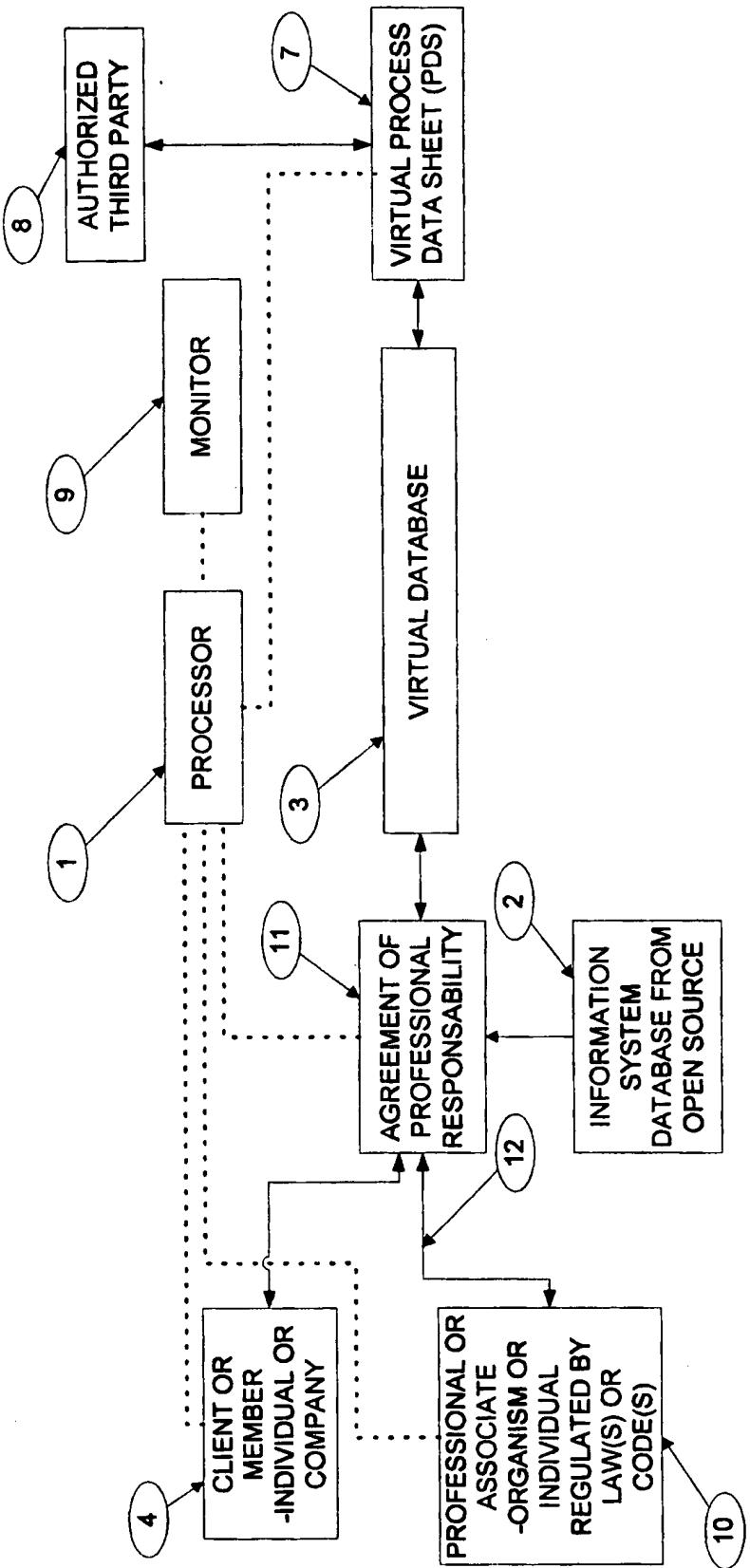
-30-

FIG.-2 VIRTUAL PROCESS METHOD FOR PROFESSIONAL CERTIFICATION
UNIVERSAL FORMAT FOR WELDING SCENARIO UNDER CODE LAW,
REGULATION AND STATE-OF-THE-ART RULES

2/10

AUTHORIZED THIRD PARTY (8)

CODE/RULE/LAW/ MONITOR (9)

DATABASE/ CONTROLLER/ PROCESSOR (1)

VIRTUAL PROCESS DATA SHEET (PDS) (7)

FOR DETAIL SEE FIG. 8, 9, 10, 11

VIRTUAL DATABASE FOR PROFESSIONAL CERTIFICATION (3)

FOR DETAIL SEE FIG. 3, 4, 5, 6, 7

encryption technology (6)

AGREEMENT OF PROFESSIONAL RESPONSABILITY (11) (12)

INFORMATION SYSTEM DATABASE FROM OPEN SOURCE (2)

CLIENT OR MEMBER -INDIVIDUAL OR COMPANY (4)

PROFESSIONAL OR ASSOCIATE -ORGANISM OR INDIVIDUAL REGULATED BY LAW(S) OR CODE(S) (10)

FOR DETAIL SEE FIG. 6

FOR DETAIL SEE FIG. 7

FIG.-3 HUB AND SPOKE ALLOCATION
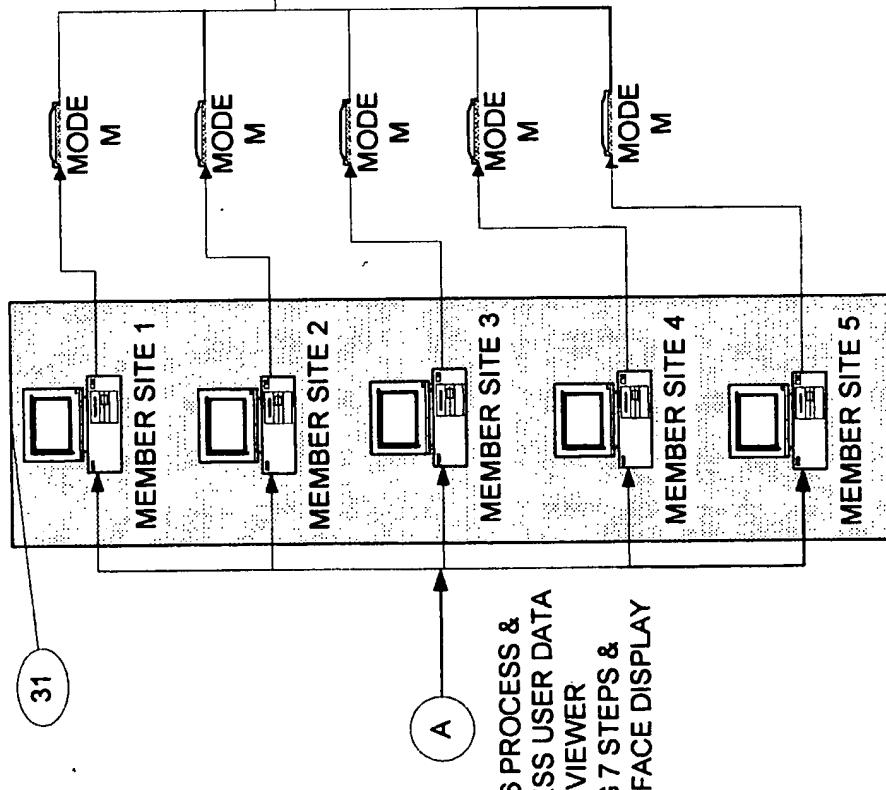
LINK TO EXTERNAL NETWORK VIA
COMMUNICATION CABLES.
(COAXIAL, PHONE LINE, OPTIC
FIBER, ECT.)

INTERNET SERVER

33

ADMINISTRATOR/
CONTROLLER

HUB

MODE
M

32

FIG 4 PROCESS DATA
TRADE INDEXER

B

37

MAIN
PROCESS
DATABASE

NOTORIZATION
DATABASE

PROCESS
REPORT
DATABASE
(AUDIT STEPS)

38

MEMBER
INFORMATION
DATABASE

AUTHENTIFICA
TION
DATABASE

39

34

35

36

OPEN CERTIFICATION DATABASE
CENTER SITE

MODE
M

MODE
M

MODE
M

MODE
M

MODE
M

MEMBER SITE 1

MEMBER SITE 2

MEMBER SITE 3

MEMBER SITE 4

MEMBER SITE 5

31

A

FIG. 6 PROCESS &
PROCESS USER DATA
VIEWER
FIG 7 STEPS &
INTERFACE DISPLAY

FIG.-3 IS A DIAGRAM PHYSICALLY SHOWING THE
CONFIGURATION OF A PREFERRED EMBODIMENT OF A 'HUB AND
SPOKE FOR AN ELECTRONIC VIRTUAL CERTIFICATION BY DATA
PROCESSING METHOD VIA A COMMUNICATION NETWORK;

FIG-4 PROCESS DATA TRADE INDEXER
(WELDING SCENARIO)
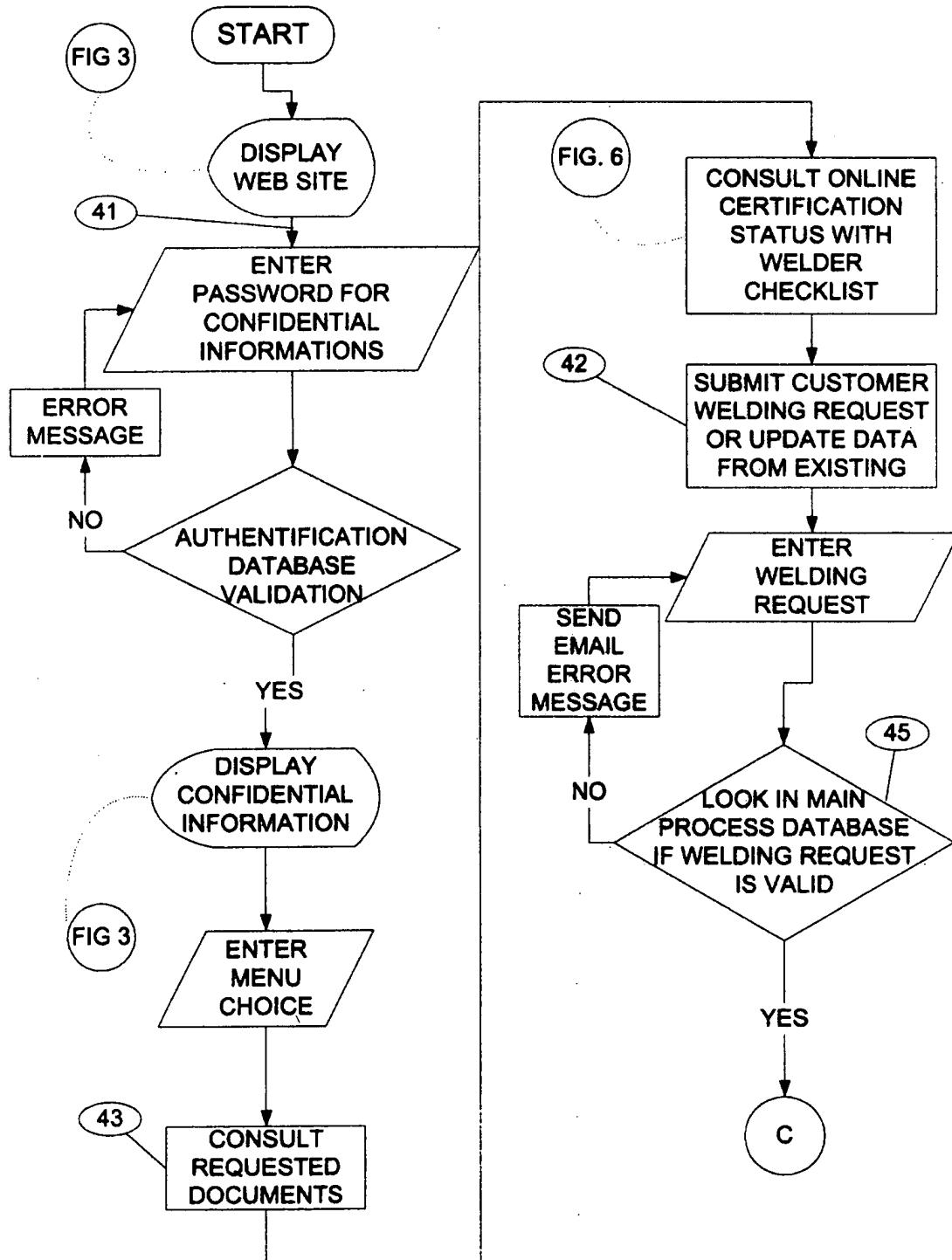
FIG.-4 PROCESS DATA TRADE INDEXER
(WELDING SCENARIO)

C

PRODUCE OR
UPDATE WELDING
DOCUMENT

44

FIG 5
& 6

UPDATE
WELDING
DOCUMENT

SUBMIT WELDING
DOCUMENT TO CODE
REQUIREMENT FOR
CERTIFICATION

CHECK WELDING
PARAMETERS UNTIL
DOCUMENT IS ACCORDING
TO THE REGULATION
CODE

NO

YES

UPDATE CLIENT WEB
DISK SPACE WITH NEW
DOCUMENT

UPDATE
WELDING
DOCUMENT

CLIENT OR MEMBER -
INDIVIDUAL OR COMPANY
NOTIFICATION FOR
UPDATED WELDING
INFORMATION

YES

IF WELDING TEST
ARE PERFORMED

NO

END
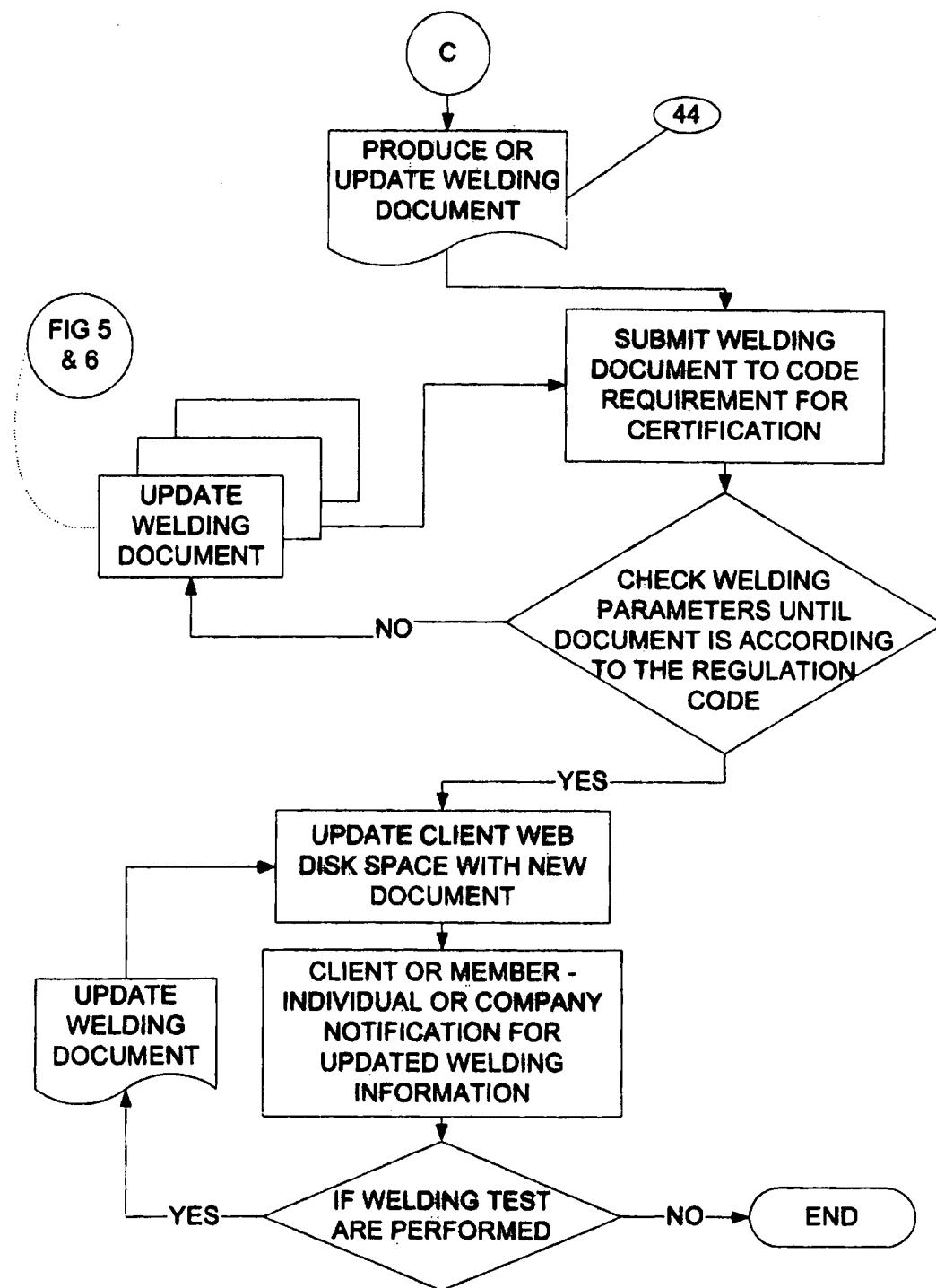
FIG. 4 IS A FLOWCHART SHOWING AN OPERATION FLOW OF THE DATA
TRADE INDEXER FOR A CERTIFICATION, THIS METHOD IS APPLIED TO A
WELDING CERTIFICATION SCENARIO.

# FIG.-5 MAIN PROCESS DATABASE
(WELDING SCENARIO)

(51) PRODUCE WELDING DOCUMENT

(52)

REPRODUCE AN OTHER WELDING DOCUMENT WITH THE ENGINEER SEAL

SUBMIT WELDING DOCUMENT FOR ONLINE CERTIFICATION

Yes

SUBMIT WELDING DOCUMENT TO AN ENGINEER FOR APPROVAL

(38)

CONSULT NOTORIZATION DATABASE

(37)

CONSULT MAIN PROCESS DATABASE

NO

(54)

NOTARIZATION OF WELDING DOCUMENT WITH WELDING ESSENTIALS VARIABLES

NO

DO LOOP WELDING VARIABLES UNTIL IT'S CONFORM TO A DESIGNED REGULATION CODE

YES

ADD THIRD PARTY SEAL OF APPROVAL TO INSURE THAT THE DOCUMENT IS CONFORM TO REGULATION CODE

YES

IF A THIRD PARTY REGULATION IS REQUIRED

(55)

FIG. 5 IS A FLOWCHART SHOWING AN OPERATION FLOW OF THE MAIN PROCESS DATABASE WITH THE NOTARIZATION DATABASE APPLIED TO A WELDING CERTIFICATION SCENARIO;

FIG.-6 PROCESS & PROCESS-USER DATA VIEWER
(WELDING SCENARIO)
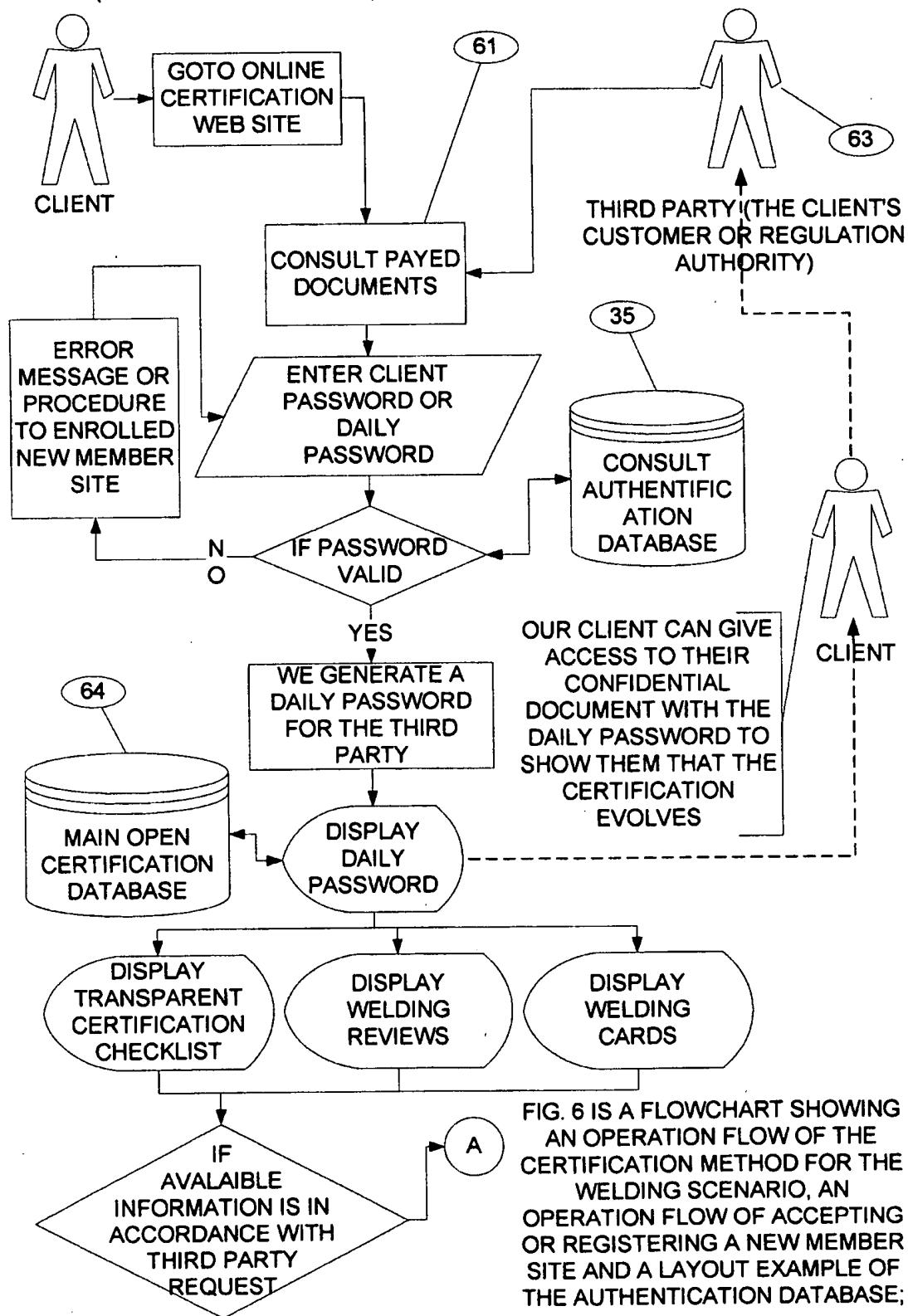
FIG. 6 IS A FLOWCHART SHOWING AN OPERATION FLOW OF THE CERTIFICATION METHOD FOR THE WELDING SCENARIO, AN OPERATION FLOW OF ACCEPTING OR REGISTERING A NEW MEMBER SITE AND A LAYOUT EXAMPLE OF THE AUTHENTICATION DATABASE;

# FIG.-7 CERTIFICATION STEPS & INTERFACE DISPLAY (WELDING SCENARIO)
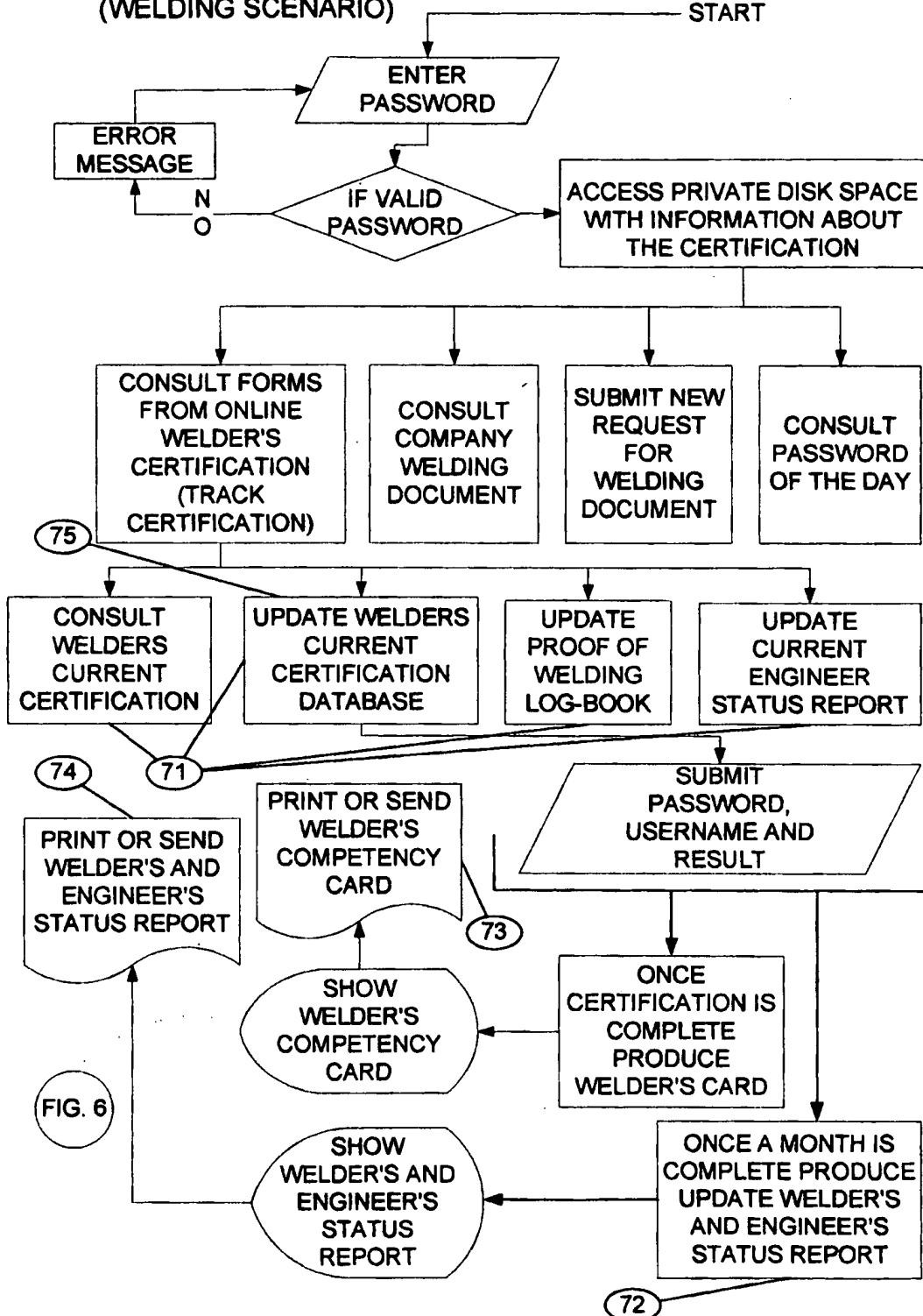
FIG. 7 IS A FLOWCHART SHOWING AN OPERATION FLOW OF CERTIFICATION STEPS & INTERFACE DISPLAY FOR THE WELDING SCENARIO.

-37-

FIG. 8 EXAMPLE OF WELDING CARD HOLDER

YOUR LOGO,	CARD NO 0472-2	WELDER & WELDING OPERATOR QUALIFICATION REPORT
YOUR COMPANY		CERTIFIED COMPLIANT OF THE CODE : AWS D1.1
CARD HOLDER ⑧¹	WELDER'S NAME	TEST BY CLAUDE CHOQUET ⑧⁴
EMISSION DATE	JUNE 14 2001	DATE OF APPROBATION 16 JUIN 2000
EXPIRATION DATE	JUNE 13 2003 ⑧²	⑧⁵
PROCESS	GMAW	APPROVED BY : SUPERVISER'S NAME
POSITION	FLAT	
ÉLECTRODE/ FILLER METAL	ER480-S6 ⑧³	
MINIMUM PERMITTED TH'K	5/8 "	SUPERVISER HOLDER'S SIGNATURE

FIG. 8 IS A DIAGRAM SHOWING AN EXAMPLE OF WELDING CARD HOLDER

FIG. 9 EXAMPLE OF ON-LINE WELDING CERTIFICATION CHECK LIST
TRACEABILITY OF WELDER TEST
SCHEDULING OF THE QUALIFICATION OF THE WELDERS
WELDING OPERATING MACHINE WELDER AND WELDING OPERATOR
QUALIFICATION TEST PLANNING SHEET   91

EVOLUTION OF THE ON-LINE CERTIFICATION				
WELDER NAME				
BASE METAL :		**FILLER METAL:**		
DATE :		**WELDER TEST REF.:**		
ITEM NO	**OPERATION**		**RESP.**	**DIGITAL PRINT**
1	GET THE BASE METAL ACCORDING TO THE CODE TEST		AW	UPDATE
2	GET THE FILLER METAL ACCORDING TO THE CODE TEST		AW	UPDATE
3	REVIEW THE WELDING DATA SHEET WITH THE WELDING ENGINEER		WE	UPDATE
4	PREPARATION OF THE ASSEMBLY (CHAMFERING AND TACKING)		AW	UPDATE
5	PUNCH THE ASSEMBLY		AW	UPDATE
6	GET IN CONTACT WITH THE WELDING ENGINEER		AW	UPDATE
7	VERIFICATION OF THE PREPARATION BY THE		AW	UPDATE
			AW	
16	- BENDING			
17	- EVALUATION OF THE RESULTS		AW	UPDATE
18	ACCEPTED ☐ REFUSED ☐		WE	UPDATE
19	IF TEST BY X-RAY ACCEPTED ☐ REFUSED ☐		LABO	UPDATE
20	ASSESSMENT OF THE RESULTS BY THE RESPONSIBLE PERSON		AW	UPDATE
21	TRANSCRIBE THE RESULTS ON THE B AND D FORMS		AW	UPDATE
22	TRANSMISSION OF THE RESULTS TO THE DIFFERENT INTERVENING PARTIES		AW	UPDATE

92   93

94   95
CERTIFICATION STATUS DATED OF: 02-08-14 09:56:36
LEGEND : W: WELDER; WE: WELDING ENGINEER; AW: AUTHORIZED
WORKER; LABO: LABORATORY

96

FIG. 10 LIST OF ESSENTIAL VARIABLES FOR WELDING CERTIFICATION
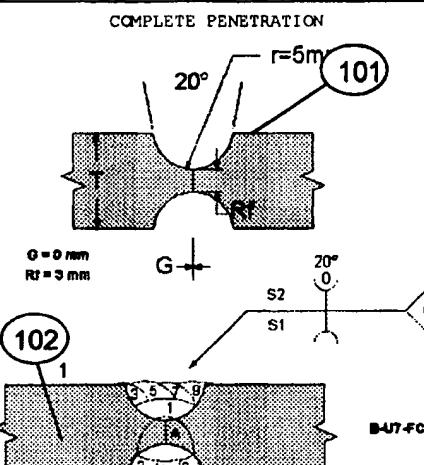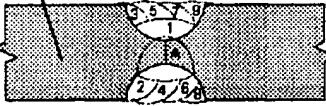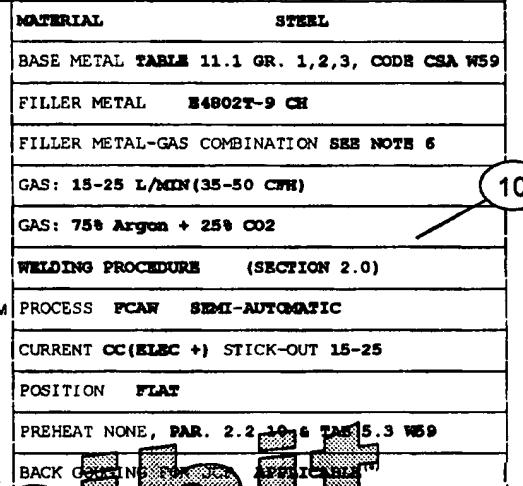
WELDING DATA SHEET	NO: F7-1 B1 12 25-5	SECTION ...3.0......
		PART .B480XT-9 CH.
		PAGE ....-.......
		DATE ...june 20 2001
		REVISION ...0.......

COMPLETE PENETRATION

MATERIAL	STEEL
BASE METAL TABLE 11.1 GR. 1,2,3, CODE CSA W59	
FILLER METAL B4802T-9 CH	
FILLER METAL-GAS COMBINATION SEE NOTE 6	
GAS: 15-25 L/MIN(35-50 CFH)	
GAS: 75% Argon + 25% CO2	
WELDING PROCEDURE (SECTION 2.0)	
PROCESS FCAW SEMI-AUTOMATIC	
CURRENT CC(ELEC +) STICK-OUT 15-25	
POSITION FLAT	
PREHEAT NONE, PAR. 2.2.10 & PAR 5.3 W59	
BACK GOUGING NOT APPLICABLE	

TYPE OF JOINT BUTT JOINT U-GROOVE WITH BACK GOUGING

T MM (IN.)	FIG NO	LAYER NO (2)	PASS NO (2)	ELECTRODE DIAM. MM (IN.)	AMPERES	VOLTS	WELDING SPEED MM (IN.)/MIN	WIRE SPEED (IN./MIN)	RATE DEPOSITION (LB/HRS)
15(5/8)	1	1	1	1.2	300-370	26-30	250-325(10-13)	445	11.46
	2	4	2	"	"	"	250-325(10-13)		
25(1)	1	1-3	1-3-5-7-9	"	300-370	26-30	200-300(09-12)	445	11.46
	2	4	2-4-6-8	"	"	"	200-300(09-12)		
FOR ALL	2	2	A	"	"	"	200-300(09-12)	"	"

NOTE (1): THE WELDING SPEED IS GIVEN AS A REFERENCE OR A GUIDE BECAUSE IT IS FUNCTION OF CURRENT, VOLTAGE AND SIZE OF WELD REQUIRED OR DEPOSITED.

(2): GO TO PARA 2.2.12 FOR ALLOWED RANGE. THE NUMBER OF PASSES AND LAYERS CAN BE GREATER AND IS ADJUSTED DEPENDING OF THE NEEDS FOR INTERMEDIATES DIMENSIONS. VOIR PARA 2.2.12 FOR ALLOWED RANGE.

(3): GO TO PARA 2.2.12 FOR THE ALLOWABLE RANGE IN VARIABLES (AMPS., VOLT, GAS).

(4) : GO TO PARA 2.2.12 FOR WELDING TECHNIQUE
(5) : THE WELDING SPEED IS AN AVERAGE VALUE FOR ALL PASSES OF EACH SIDE.
(6) : THE FILLER METAL - GAS COMBINATION MUST BE APPROVED.

FIG. 10 IS A DIAGRAM SHOWING AN EXAMPLE OF LIST OF ESSENTIALS VARIABLES FOR WELDING CERTIFICATION.

VIRTUAL PROCESS METHOD FOR PROFESSIONAL CERTIFICATION UNIVERSAL FORMAT FOR ALL PROFESSIONS UNDER CODE LAW, REGULATION AND STATE-OF-THE-ART RULES